Lecture Module - To Err is Human

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

Topic 3 - Repeatability and Testing

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- Instrument Repeatability
- Conditions for Repeatability
- Reproducibility and Instrument Uncertainty

Instrument Repeatability

"The ability of a measurement system to indicate the same value on repeated but independent application of the same input provides a measure of the instrument repeatability. Specific claims of repeatability are based on multiple calibration tests (replication) performed within a given lab on the particular unit."

$$\%u_{R_{max}} = \frac{2s_x}{r_0} \times 100$$

Text: Theory and Design of Mech. Meas.

Conditions for Repeatability

The following conditions need to be fulfilled in the establishment of repeatability:

- the same experimental tools
- the same observer
- the same measuring instrument, used under the same conditions
- the same location
- repetition over a short period of time.
- same objectives

Text: Wikipedia(NIST)

Reproducibility and Instrument Uncertainty

"The term reproducibility, when reported in instrument specifications, refers to the closeness of agreement in results obtained from duplicate tests carried out under similar conditions of measurement ...

... The term instrument precision, when reported in instrument specifications, refers to a random uncertainty based on the results of separate repeatability tests."

Text: Theory and Design of Mech. Meas.